

#SB277: Communications on Twitter about California's law eliminating non-medical exemptions for childhood vaccinations

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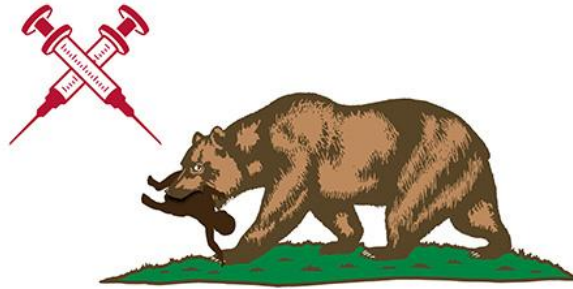
8/1/16

Goals of SB277 Project

- Analyze Twitter communications about SB277 with respect to:
 - 1) Communication theories, i.e., Multi-level Model of Meme Diffusion (Spitzberg, 2014)
 - 2) Social Network Analysis
 - 3) Behavioral Health Analysis
 - 4) Integration of these analytic methods and perspectives

Mandatory Vaccinations
are Un-Constitutional
and Unethical!

It's
AMERICA
not
A-MERCK-A!



CALIFORNIA REPUBLIC

If there is a
RISK

There must be a

CHOICE

NO on SB 277

www.sb277.org



Reason #3 I want SB277 to pass:

**Uniformly high vaccine uptake
rates help protect those who
cannot be vaccinated.**



If anti-vaxxers think their children
should be able to avoid **vaccines**
no matter how small the risk,
shouldn't I be able to
avoid **unvaccinated children**
no matter how small the risk?

YES
on
SB277

<http://vision.sdsu.edu/hdma/smart/vaccineExemption>



Prevalence of tweets mentioning SB277

- Between May 27, 2015 and April 29, 2016, **133,755** tweets mentioning SB277 were downloaded by SMART Dashboard

Timeline of Some SB277 Events

Date	Event
2/19/15	SB277 introduced by Richard Pan, MD
6/25/15	SB277 passed CA Assembly floor
6/29/15	SB277 passed CA Senate floor
6/30/15	CA governor Davis signed SB277 into law
7/28/15	Dr. Pan battled recall by anti-vaccine activists
9/16/15	Trump linked child vaccines to autism in Republican primary debate
9/30/15	Referendum to repeal SB277 failed to get enough signatures
10/13/15	CA governor Davis signed SB792
1/11/16	Mark Zuckerberg posted picture of daughter being vaccinated
2/10/16	Anti-vaccine billboards go up to coincide with Super Bowl 50
4/13/16	Robert De Niro supported anti-vaccine movement on TV
7/1/16	SB277 went into effect

Social Network Analysis

Overview of Social Network Analysis

- To characterize the social networks of twitter users tweeting about SB277
- Tweets within 5 days of 9 major event (2 days before and 2 days after) were analyzed
- In-degree, out-degree and page-rank analyses performed to understand similarities and differences

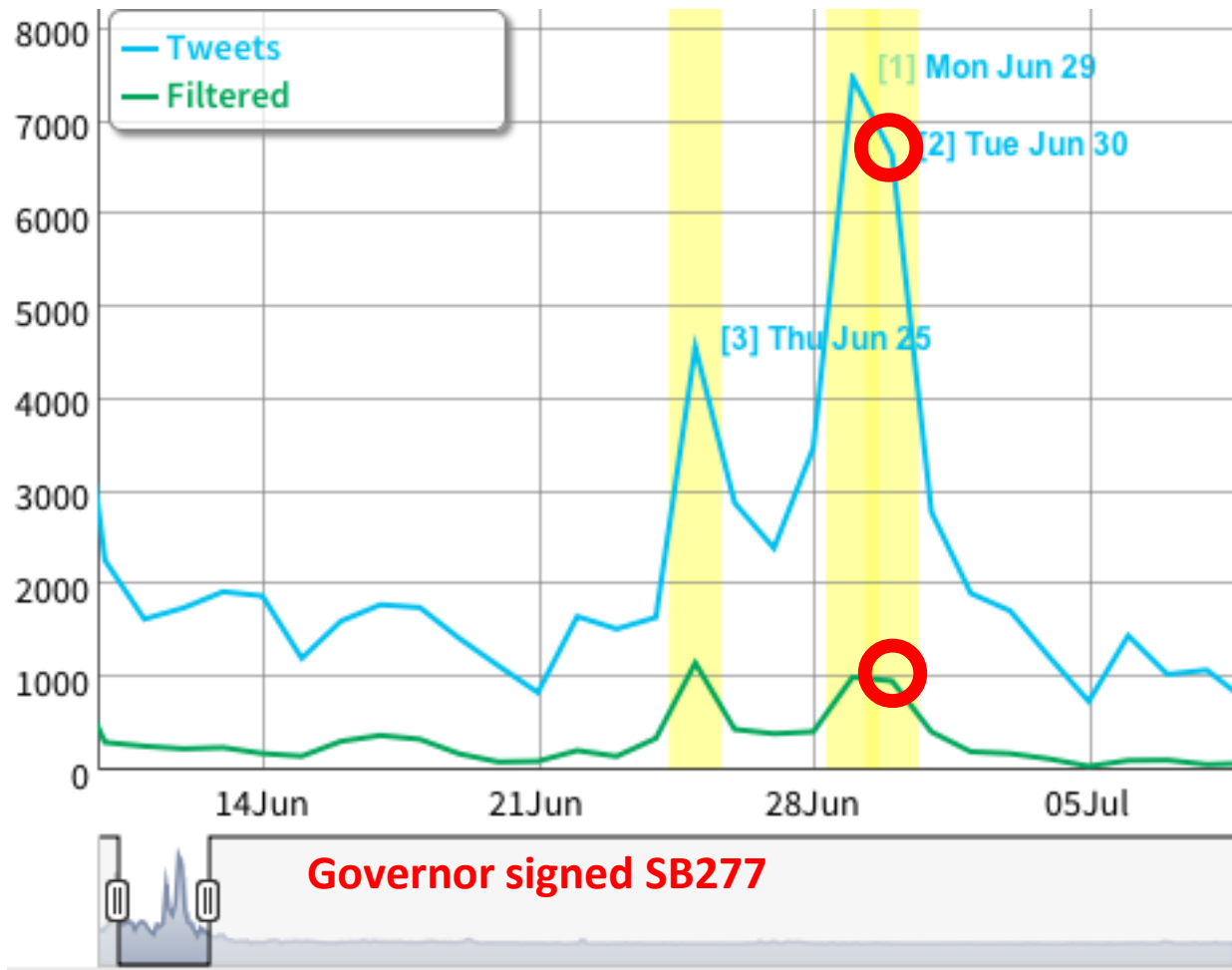
In-Degree, Out-Degree & Page Rank

- **In-degree** – measure of how popular someone is
 - Number of times a person is mentioned (@) and/or their tweets are retweeted by other users
- **Out-degree** – measure of how active someone is
 - Number of other twitter users mentioned or retweets by a user
- **Page-rank** – similar to In-degree, but weighted by the influence of the people mentioning and retweeting them

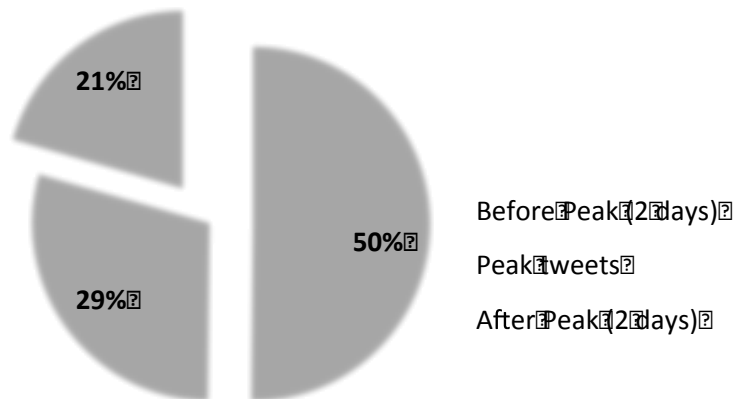
Example:

6/30/2015 - Governor signed SB277

Tracking Events in Smart Dashboard



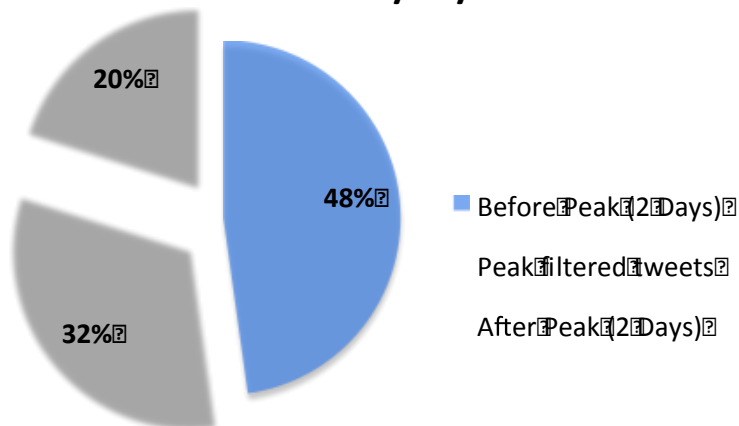
Event Attention Degree for the Peak
Tweets of 6/30/2015



Before Peak (2 Days)	11839
Peak tweets	6915
After Peak (2 Days)	4852

Total number of tweets (5 days):
23,606

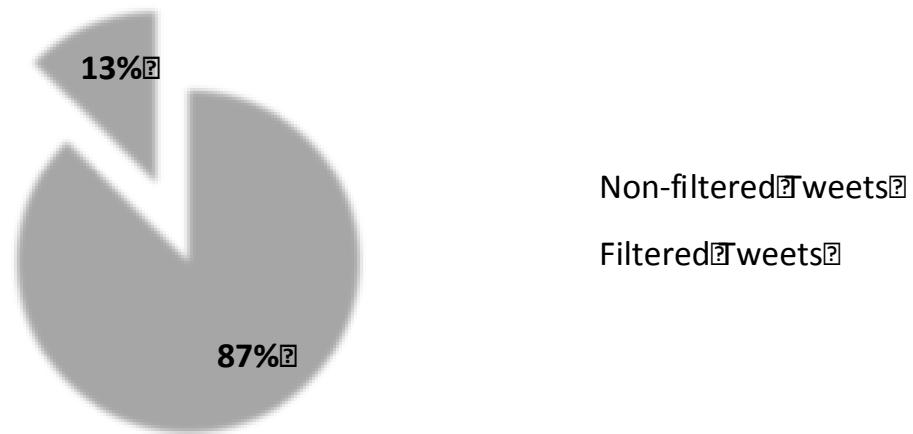
Event Attention Degree for the Filtered
Peak Tweets of 6/30/2015



Before Peak (2 Days)	1483
Peak filtered tweets	996
After Peak (2 Days)	624

Total number of Filtered tweets
(5 days): 3,103

Ratio between Filtered and Non-filtered Tweets Peak of 06/30/2015

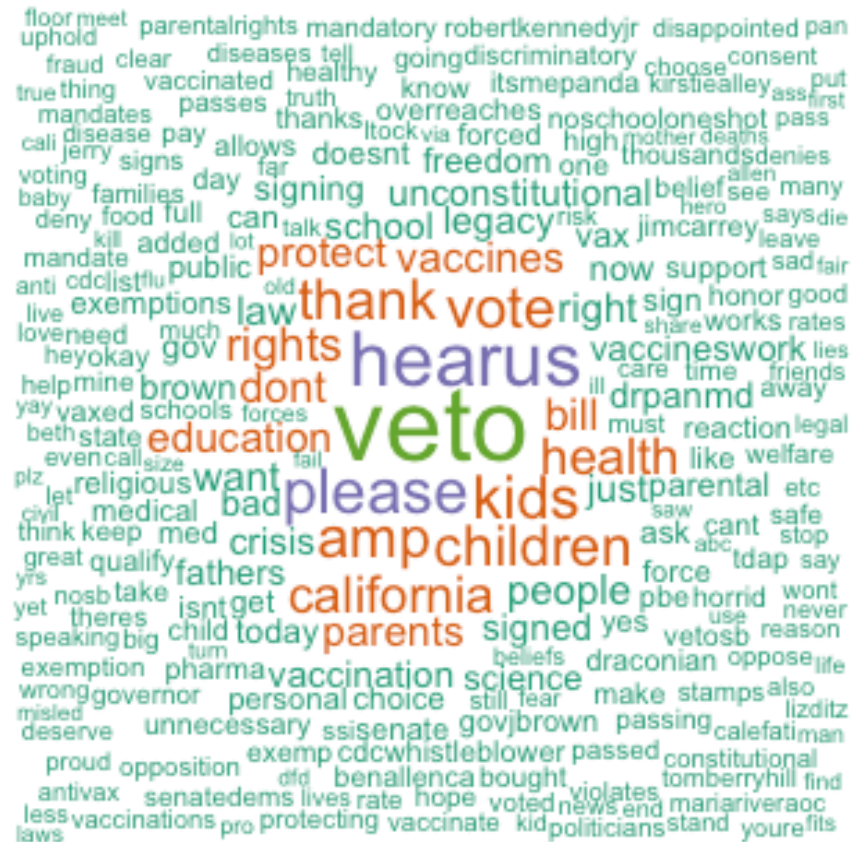


Word Cloud of all 5 Day Tweets (peak 06/30/2015)

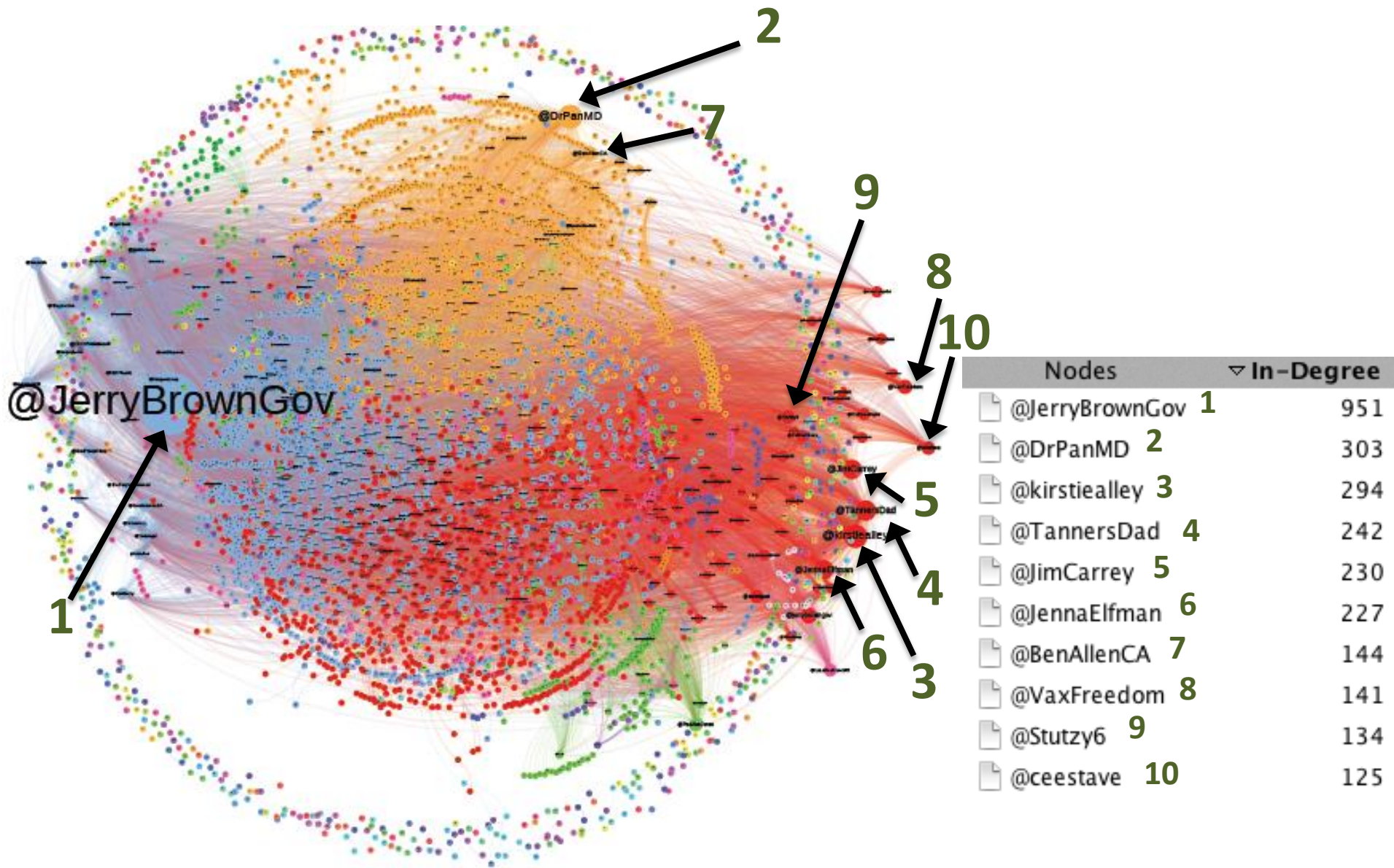
All Tweets



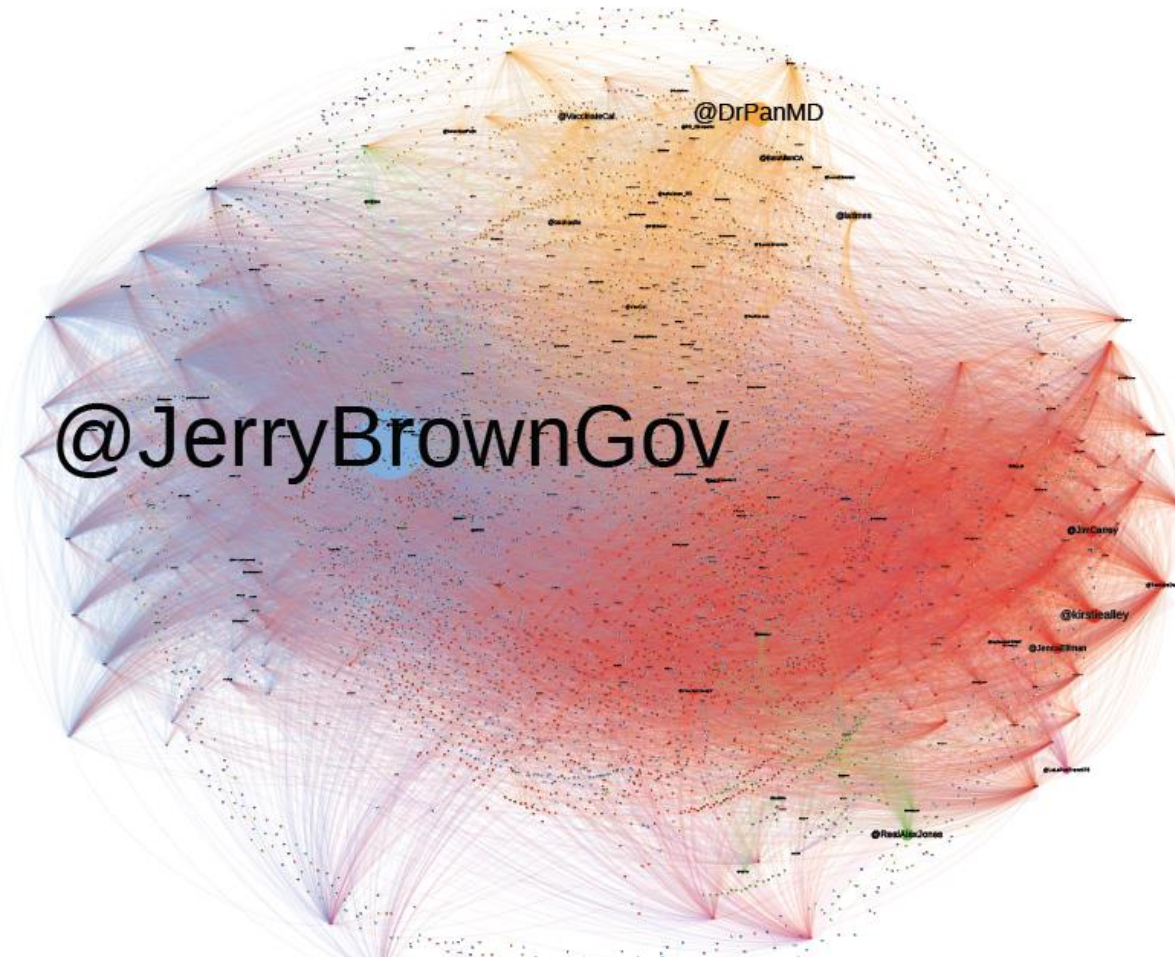
Filtered Tweets



All 5 Days SNA (In-degree) of 06/30/2015 peak

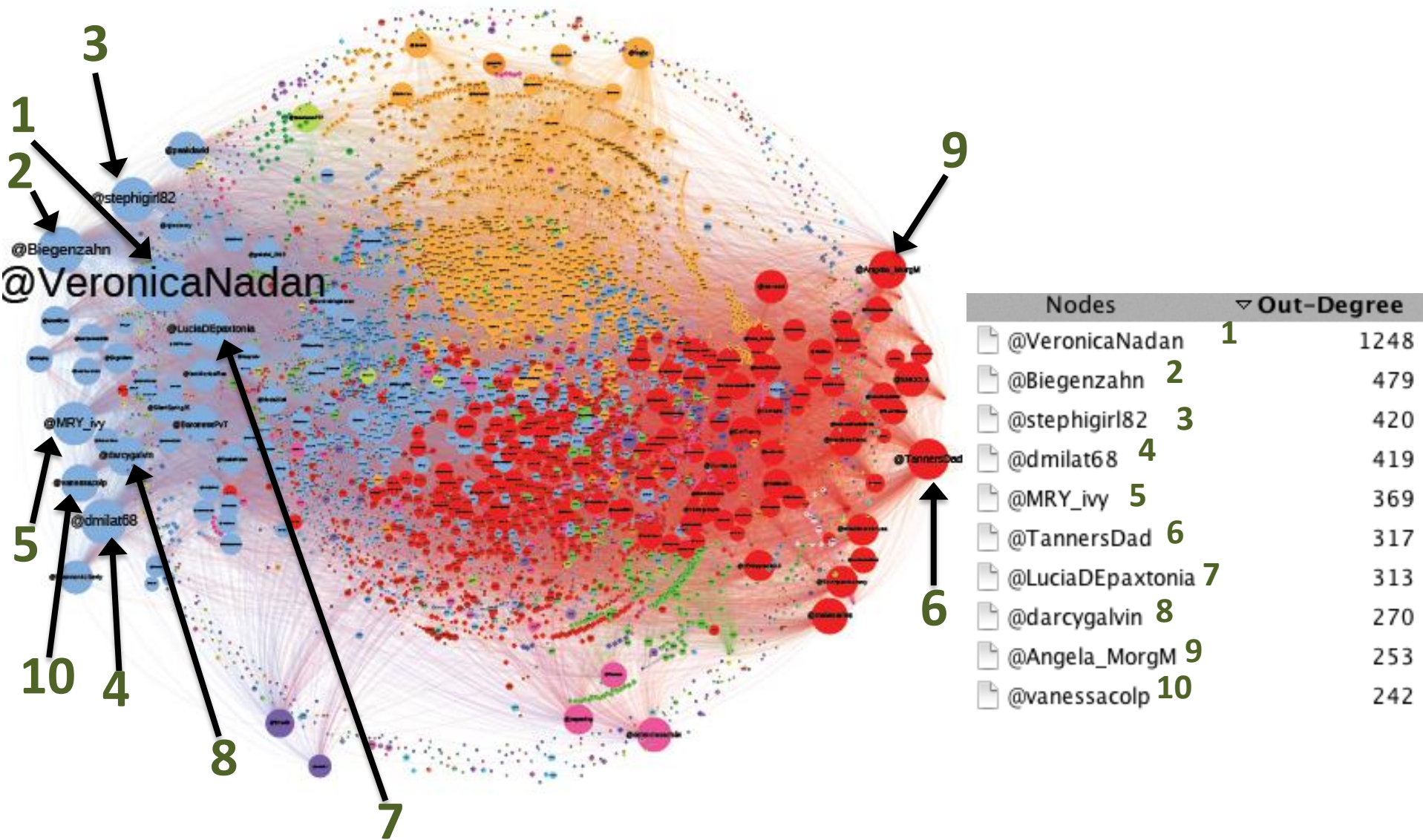


All 5 Days SNA (Page Rank) of 06/30/2015 peak



Nodes	PageRank
@JerryBrownGov	0.041
@DrPanMD	0.013
@kirstiealley	0.007
@RealAlexJones	0.006
@JimCarrey	0.006
@JennaElfman	0.005
@latimes	0.005
@VaccinateCal	0.005
@BenAllenCA	0.005
@tarahaelle	0.004
@LaLaRueFrench75	0.003
@TannersDad	0.003
@VaxCali	0.003
@ashulman_RS	0.003
@AmerAcadPeds	0.003
@RS_JSkropanic	0.003
@VaccineXchange	0.003
@WIRED	0.003
@SenatorMoorlach	0.003

All 5 Days SNA (Out-degree) of 06/30/2015 peak

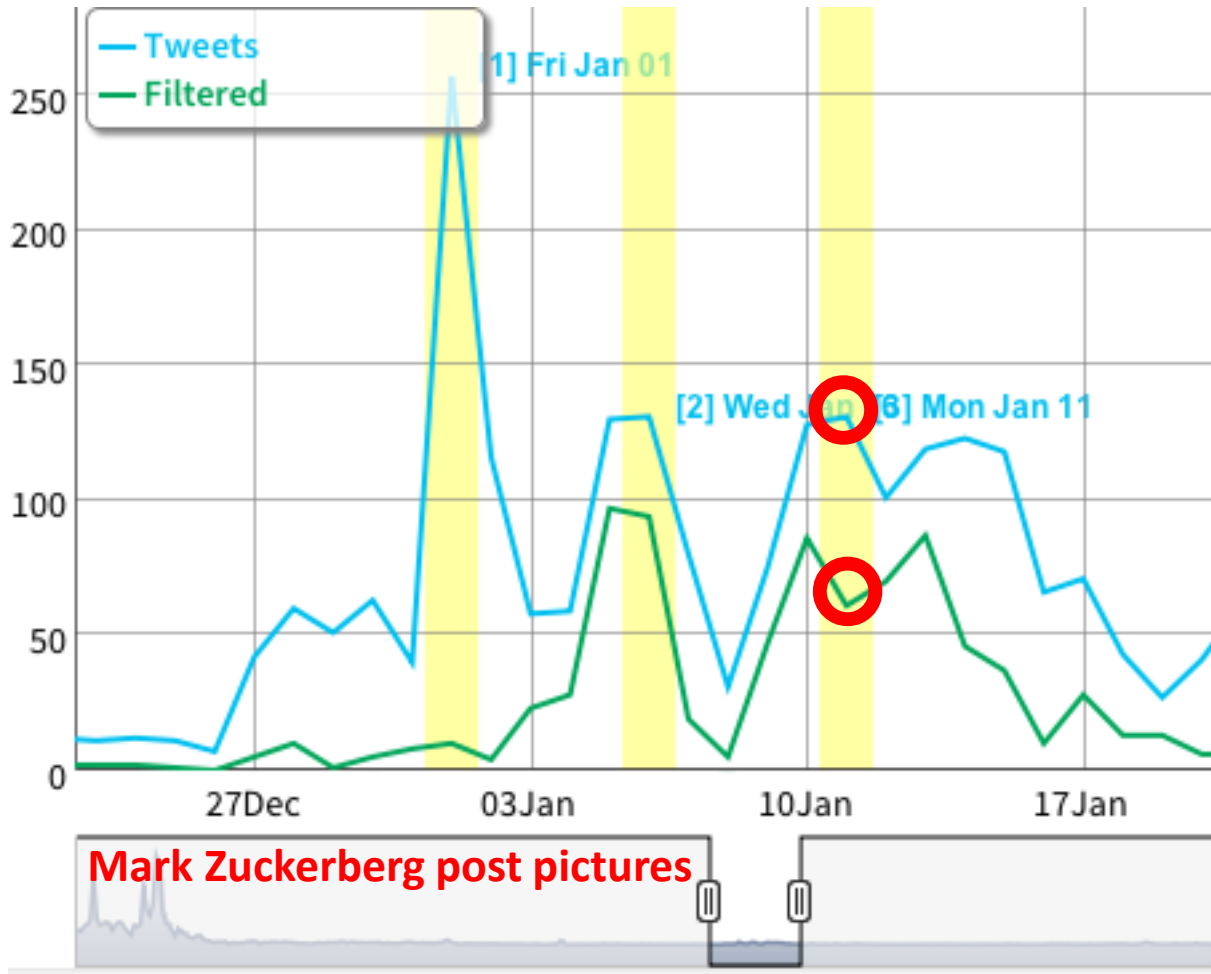


- 3 major groups: red, blue, and orange.
- **Based on In-degree:**
 - Jerry Brown has the highest in-degree which correlate with the event (Jerry Brown signed SB 277).
 - Even though the highest in-degree (JerryBrownGov) was found within the blue group, the majority of the group in red represent the utmost influential opinion leaders in the network, and are mostly opponents of SB277.
 - The group in orange illustrated by Dr. Richard Pan and Ben Allen (high in-degree), are both supporters of SB277. Dr. Pan authored California legislation in 2012 that forces parents to consult with a doctor before using exemptions for vaccines.
- **Based on Out-degree:**
 - The majority of the group in blue represent the chatters, which are interested in re-tweeting or mentioning other user tweets. They are characterized by the diversity within its members between opponents (VeronicaNadan, Out-Degree) and advocates (JerryBrownGov, In-Degree) of SB 277.

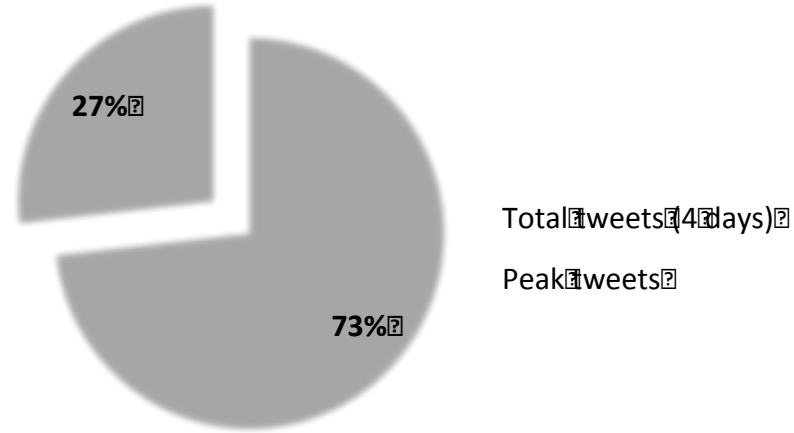
Example:

**01/11/2016 - Mark Zuckerberg post
pictures**

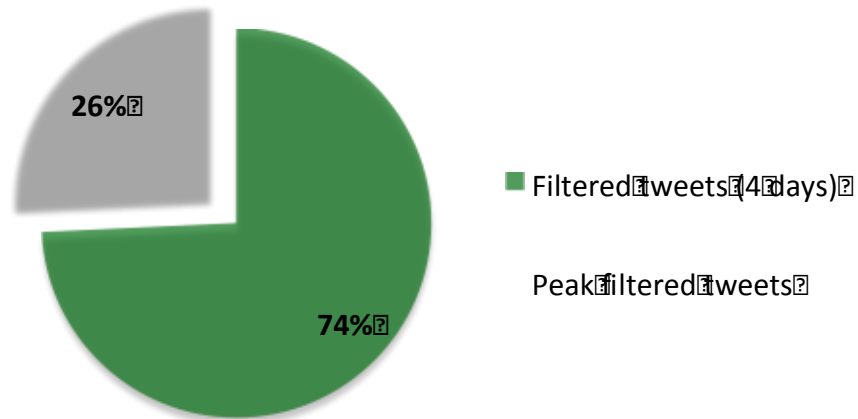
Tracking Events in Smart Dashboard



Event Attention Degree for the Peak
Tweets of 01/11/2016



Event Attention Degree for the Filtered
Peak Tweets of 01/11/2016



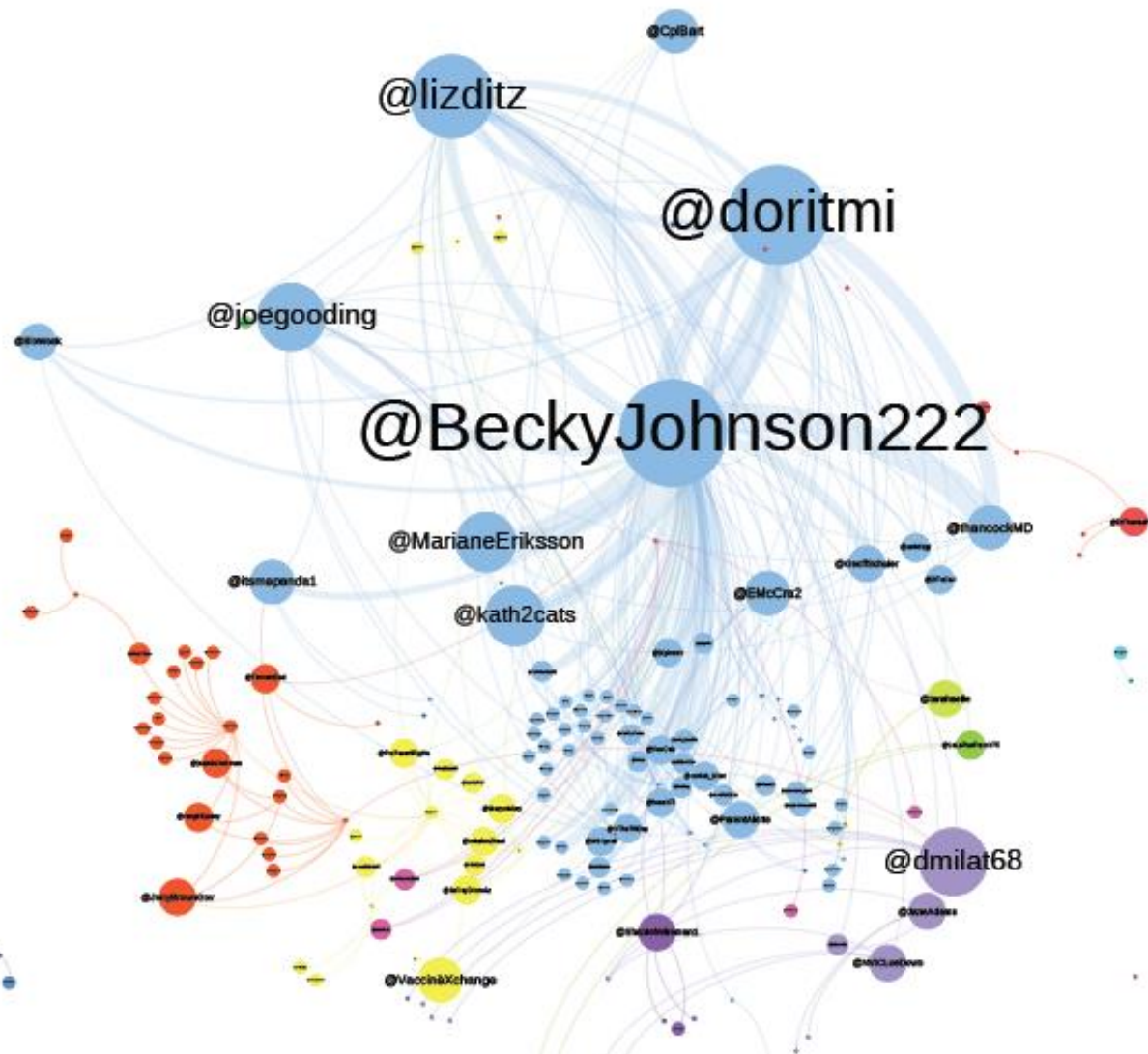
All Tweets



Filtered Tweets

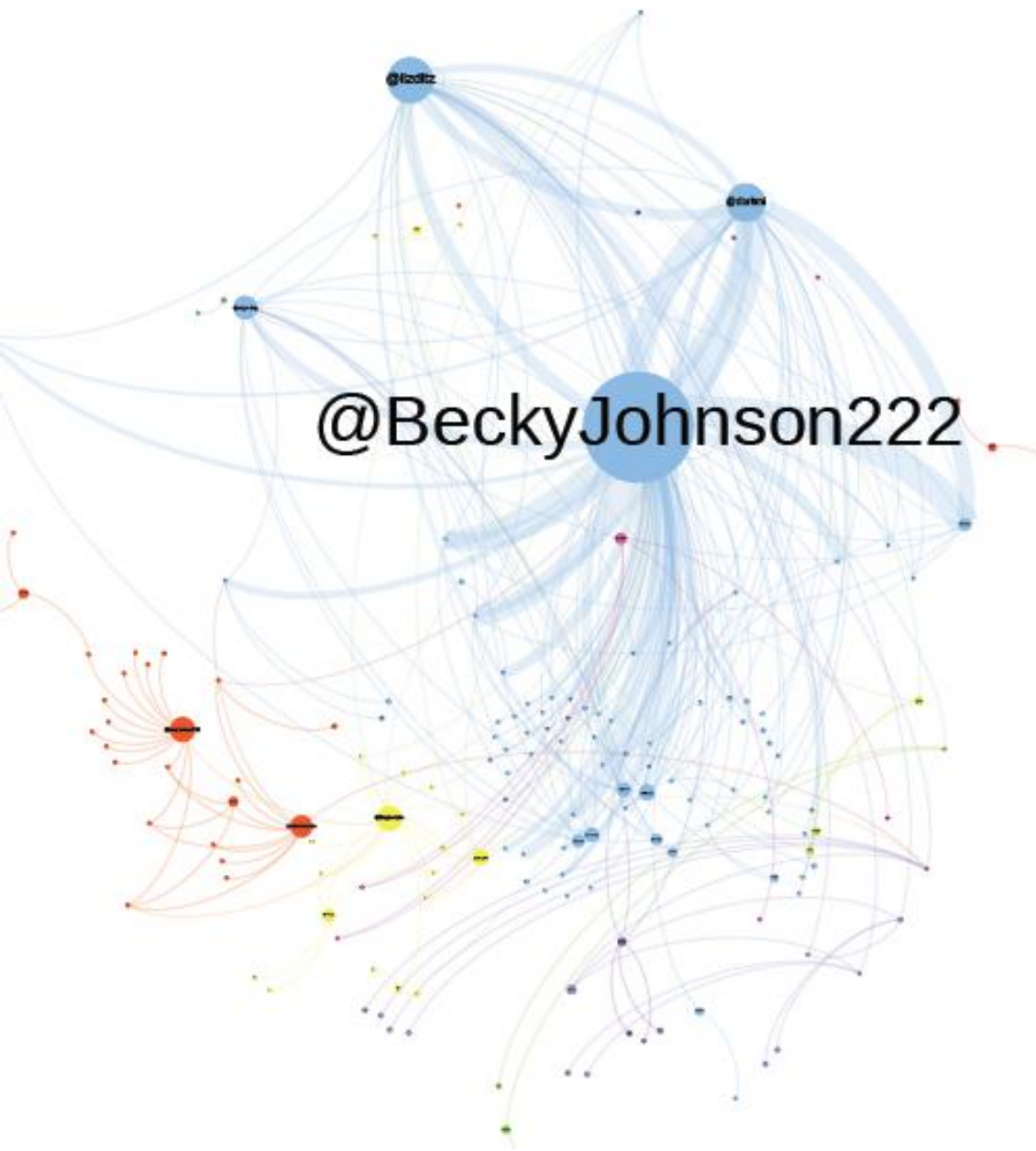


In-degree



Nodes	▼ In-Degree
@BeckyJohnson222	13
@doritmi	12
@lizditz	10
@joegooding	8
@dmilat68	8
@kath2cats	7
@MarianeEriksson	7
@EMcra2	5
@thancockMD	5
@VaccineXchange	5
@CplBart	5
@itsmepanda1	5
@GeoffSchuler	4
@JerryBrownGov	4
@ShantelWireman1	4
@BioWonk	4
@JaneAdams	4
@tarahaele	4
@NVICLoeDown	4
@ParentAlerte	4

Out-degree



Nodes	▽ Out-Degree
@BeckyJohnson222	70
@lizditz	27
@doritmi	22
@soccermom818	13
@Biegenzahn	13
@joegooding	12
@defendressofsan	11
@UrieBay	7
@pinksy4U	7
@InThe7thDay	6
@bgordski	6
@thancockMD	5
@MJScanlonOH	5
@mimuluxArt	5
@drpaulmorgan	4
@Just4TheCause	4

Top 5 Influential Users – In-degree Analysis

Users	Count
VaccineXchange	8
doritmi	7
NVICloeDown	7
joegooding	6
SB277Referendum	6
ceestave	5
DrPanMD	5
itsmepanda1	5
jonrappoport	5
LaLaRueFrench75	5
Stutzy6	5
TannersDad	5
DrThomasPaul	4
EMcCra2	4
HealthRanger	4
JerryBrownGov	4
lizditz	4
YouTube	4

VaccineXchange	Neutral	The Vaccine Xchange is a place where people interested in vaccine safety can come and share their stories, find answers, and read the latest scientific studies.
doritmi	Pro-VAX	Dorit Rubinstein Reiss is a Professor of Law at UC Hastings College of Law. She has also worked for the Hebrew University of Jerusalem and the Israeli Ministry of Justice's Department of Public Law.
NVICloeDown	Neutral	NVIC is a 501(c)3 charitable, non-profit educational organization founded in 1982. NVIC launched the vaccine safety and informed consent movement in America.
joegooding	Anti-VAX	New Orleans Saints! Conservatarian, #1A #2A #GlutenFree #ProLife #CCOT #PARaven #TrumpTrain Fwd by Hannity, Cupp, Corsi, Feisty, Reghetti, Duff, Starnes. PARaven.net
SB277Referendum	Anti-VAX	
ceestave	Anti-VAX	Activist for children, Mom of vaccine injured child. http://B1less.com Go to #CDCwhistleblower, http://VaxTruth.org or just stay here!
DrPanMD	Pro-VAX	Dr. Pan, a pediatrician and educator, represents Sacramento in the California Senate. With his wife, he raises two sons and runs a small business.drrichardpan.com
itsmepanda1	Anti-VAX	Answer is out there Head in hands, crying, she looked up at me & said well where is it? Vaccination=medical procedure. Don't give up your right to decide.
jonrapoport	Anti-VAX	Jon Rappoport has worked as a free-lance investigative reporter for over 30 years.
LaLaRueFrench75	Anti-VAX	Laura LaRue is an ElectroPOP singer in san francisco (from french origine) (against SB277)
Stutzy6	Anti-VAX	account against sb277 (talking about whistleblowers and falsify vaccine effectiveness)
TannersDad	Anti-VAX	One of the most Influential and Active Parent Advocates for families dealing w Autism &
DrThomasPaul	Anti-VAX	Past Life Therapy Center® Founder/Therapist with #PastLivesTherapy Author, Dr. M. Netherton. PastLifeTherapyCenter.com PastLifeRegression.com #pastliferegession
EMcCra2	Anti-VAX	Joined CDCwhistleblower community to help bring reform to vaccine policy.
HealthRanger	Anti-VAX	Consumer health advocate and editor of NaturalNews.com.
JerryBrownGov	Pro-VAX	Sign SB277
lizditz	Pro-VAX	Dyslexia consultant, autism advocate, and blogger. @k_5remediation for dyslexia; see thinkingautismguide.blogspot.com for autism advocacy. lizditz.typepad.com
YouTube	Neutral	

Top 5 Influential Users – Out-degree Analysis

Nodes	Count
Biegenzahn	8
joegooding	7
lizditz	7
defendressofsan	6
doritmi	6
dmilat68	5
MRY_ivy	5
Beckyjohnson222	4

Biegenzahn	Anti-VAX	Native NYer in SoCal. I'm an ADVOCATE for ALL CHILDREN -- NATURAL health -- REAL food -- CLEAN air -- TRUTH -- and so much more! BE KIND and WAKE UP ♡
joegooding	Anti-VAX	New Orleans Saints! Conservatarian, #1A #2A #GlutenFree #ProLife #CCOT #PARaven #TrumpTrain Fwd by Hannity, Cupp, Corsi, Feisty, Reghetti, Duff, Starnes. PARaven.net
lizditz	Pro-VAX	Dyslexia consultant, autism advocate, and blogger. @k_5remediation for dyslexia; see thinkingautismguide.blogspot.com for autism advocacy. lizditz.typepad.com
defendressofsan	Anti-VAX	#FireWoman burning bright who loves drinking in the gift of Chris Jericho baby!
doritmi	Pro-VAX	Dorit Rubinstein Reiss is a Professor of Law at UC Hastings College of Law. She has also worked for the Hebrew University of Jerusalem and the Israeli Ministry of Justice's Department of Public Law
dmilat68	Anti-VAX	Mom of 6, grandma of 3...married to my husband Jeff for 27 years. Conservative Christian. #ohHILLno #RecallJerryBrown #canpan #NOMANDATORYVACCINES
MRY_ivy	Anti-VAX	fierce mom, phd statistician, health nut.
Beckyjohnson222	Anti-VAX	Blogger, teacher, muck-raker, career malcontent, Santa Cruz 11, NO on SB277...but I take lots of coffee breaks!... kyjohnsononewomantalking.blogspot.com

Conclusion

- Filtered tweets had higher attention degree than the non filtered tweets when compared to the 5 days events collected.
- The content analysis for both, filtered and non-filtered tweets were related to specific events.
- The dynamics of the social network changed across time and events – influence depended on time and the event.

Behavioral Health Analysis

Overview of Behavioral Health Analysis

- Purpose – to understand the sources, sentiments, and content of tweets on SB277
- Apply health behavior frameworks & theories to analyze tweets on SB277
 - To what extent do behavioral theory constructs occur in Twitter communications about SB277?
 - What factors are associated with the occurrence of behavioral theory constructs in Twitter messages about SB277?

Steps of the Process

- 1) Literature review to identify behavior theories that predict whether parents vaccinate their children
 - **Health Belief Model** (Most commonly used)
 - **Theory of Reasoned Action/Planned Behavior**
- 2) Develop a code book to code SB277 tweets on key variables
 - **Source characteristics** (e.g., individual vs. orgs)
 - **Sentiments** (e.g., tone)
 - **Content information** (e.g., behavioral theory constructs)
 - **Multi-level Model of Meme Diffusion** domains

Steps of the Process

- 3) Select tweets for analysis – determine inclusion and sampling criteria
- 4) Code and analyze tweets
 - Analyze tweets in conjunction with Social Network Analysis
 - Analyze a representative sample of individual tweets to understand individuals' communications about SB277
- 5) Write paper for peer-review publication